

MAY 15 2007

Serial No. 10/770,893  
67097-022IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Song  
Serial No.: 10/770,893  
Filed: February 3, 2004  
Group Art Unit: 1742  
Examiner: Morillo, Janell Combs  
Title: CASTABLE HIGH TEMPERATURE ALUMINUM ALLOY

Commissioner for Patents  
P.O. Box 1450  
Alexandria VA 22313-1450

DECLARATION UNDER CFR 1.131

Dear Sir:

Attached Exhibit A, which will be explained in further detail below, shows that the inventor of the above application invented the subject matter of the application prior to the effective date of U.S. Publication 2004/0055671 to Olson, et al. See MPEP 706.02(b) and 715.

Exhibit A is a copy of a redacted Invention Disclosure, which was a basis of the present application. I have reviewed Exhibit A, and I have determined that at least the portion marked "X" on the sixth (last) page establishes that the inventor conceived the subject matter of the present application prior to the effective date of Olson, et al. Furthermore, I have determined that other portions, such as the portions marked "X" on page 1 and page 2, establish that the assignee and the inventor worked diligently to prepare the invention disclosure from a date before the effective date of the Olson, et al. reference at least up to the effective date of Olson, et al.

Based upon Exhibit A, I believe the inventor conceived the subject matter of the present application prior to the effective date of the Olson, et al. reference, and diligently pursued the subject matter of the present application at least up to the effective date of Olson, et al.

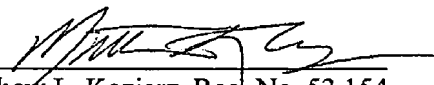
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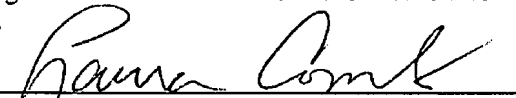
Applicant believes that no additional fees are necessary, however, the Commissioner is authorized to charge Deposit Account No. 21-0279 in the name of United Technologies Corporation for any additional fees or credit the account for any overpayment.

Respectfully Submitted,

CARLSON, GASKEY &amp; OLDS, P.C.

  
Matthew L. Koziarz, Reg. No. 53,154  
400 West Maple Road, Suite 350  
Birmingham, Michigan 48009  
Telephone: (248) 988-8360  
Facsimile: (248) 988-8363Dated: May 11, 2007CERTIFICATE OF FACSIMILE

I hereby certify that this response is being facsimile transmitted to the United States Patent and Trademark Office, 571-273-8300 on May 15 2007.

  
Laura Combs

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**EXHIBIT A**

ACKNOWLEDGE ☐SCAN ☐XFER TO PAB ☐

PATENT ADVISORY BOARD  
INVENTION DISCLOSURE SUMMARY

COGNIZANT ADVISORY BOARD: ☒ New Product ☐ License & Repair ☐ PMA

DATE TRANSFERRED TO P.A.B. [REDACTED]

DOCKET NO. [REDACTED]

TITLE: AL-Gd Alloy FOR ELEVATED TEMPS.INVENTOR(S) SONGTECHNICAL CATEGORY  
NUMBER AND NAME1ALLOYS

USG CONTRACT? [REDACTED]

Agency:

☐

DOE

☐

NASA

☐

USN

☐

USAF

☐

OTHER

TARGET DECISION DATE:

NONE

TARGET FILING DATE:

NONE

Product(s):

Explain any rights of non-P&amp;W and/or non-UTC entities (other than U.S.G.)

Remarks to P.A.B.

NONE

CONFIDENTIAL, ATTORNEY-CLIENT, ATTORNEY WORK PRODUCT. PRIVILEGED.

This form is for the use of the P&W Patent Advisory Board  
and Counsel, and is not part of the Invention Disclosure

**Internal Correspondence****United  
Technologies**Research Center  
Legal Department

TO: Kenneth Baran

RE: Docket Number: [REDACTED]

Title: "Al-Gd Alloy for Elevated Temperature Applications"

Inventors: S. G. Song

Attorney: Ronald Cummings

Enclosed is a copy of the referenced invention disclosure which was disclosed to the Research Center docket on [REDACTED] and is currently under review to determine the need for patent protection.

In view of its relation to your business, we are offering the disclosure to you for adoption. Should you choose to adopt this invention, please assign your division docket number to the disclosure and notify me so that we may close our records, and transfer the invention to your docket. I can be reached by telephone at [REDACTED] or by fax at [REDACTED].

Please contact me with your response no later than [REDACTED]. Craig Walker and John Miller at PW can comment on the patentability of this disclosure; therefore, please include them in your discussions when evaluating this invention. If there is no response by this date, we will assume adoption of this project has been declined.

The associated UTRC row and column managers copied on this memo will be notified of your decision, and may decide to file the case from UTRC, if such action seems appropriate.

Technical questions regarding this disclosure should be directed to the inventors.

*Ronald Cummings*Ronald Cummings  
Assistant Intellectual Property Counsel  
MS 129-06

Enclosure (via interoffice mail)

**To Addressee: Important - Return This Sheet By Fax To 860 610-7248**

1. Decision to adopt to our unit: ☐ YES I wish to adopt. ☐ NO I decline to adopt.
2. Reason for decline: \_\_\_\_\_

Signed and Dated: \_\_\_\_\_

## UTRC INVENTION DISCLOSURE ROUTING SLIP

**TO BE COMPLETED BY INVENTOR:** Please Enter The Title of the Invention, Names Of Inventor(s), and Names Of Division Program Leader(s) (DPL(s)) for the Business Unit(s) ("BU") listed in question 4(a) of the UTRC Invention Questionnaire.

TITLE:	Al-Gd alloy for elevated temperature applications		
INVENTOR(S):	Shihong G. Song		
DPL Name: <u>Vince Nardone</u>	BU: <u>P &amp; W</u>	*Initials: <u>UCN</u>	*Date: <u>[REDACTED]</u>
DPL Name: <u>Michael Winter</u>	BU: <u>HS</u>	*Initials: <u>[REDACTED]</u>	*Date: <u>[REDACTED]</u>
DPL Name: <u>      </u>	BU: <u>      </u>	*Initials: <u>      </u>	*Date: <u>      </u>

## SHADED AREAS TO BE COMPLETED BY DIVISION PROGRAM LEADER (DPL)

You have been sent the attached original Invention Disclosure and UTRC Invention Questionnaire because the invention may benefit the Business Unit ("BU") for which you are responsible. The purpose of your review at this time is mainly informational. Within two weeks of receipt:

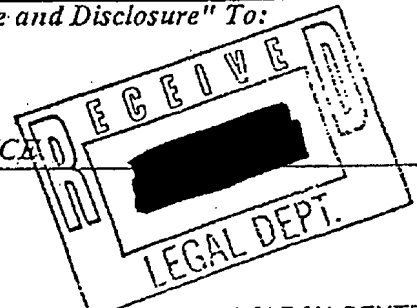
1. Please review the Invention Disclosure and initial and date in the space provided above\*.
2. In Item 1.(d) of the UTRC Invention Questionnaire, the inventors of the present invention were asked to list the names of the individuals at the BU who should be contacted to evaluate this invention. If you believe that additional individuals at the BU should be contacted, please list their names and association below.

Additional Evaluator Name: _____	Business Unit: _____
Additional Evaluator Name: _____	Business Unit: _____
Additional Evaluator Name: _____	Business Unit: _____

3. If you are the only or last listed DPL, please forward this package to the UTRC Law Department at the address indicated at the bottom of the page. The UTRC Law Department will forward the attached to the relevant BU(s) for adoption. The BU(s) will, in turn, decide whether it is interested in adopting this invention. As a DPL for a BU that may benefit from the invention, if you feel that such BU should adopt the invention, you are encouraged to contact that BU and apprise the appropriate individuals of your views.
4. If you are not the only or last listed DPL, please forward this package to the next listed DPL. As a DPL for a BU that may benefit from the invention, if you feel that such BU should adopt the invention, you are encouraged to contact that BU and apprise the appropriate individuals of your views.

Last listed DPL: Forward The "Routing Slip, Questionnaire and Disclosure" To:

UTRC LAW DEPARTMENT  
MS 129-6  
ATTENTION: LORETTA N. LAWRENCE



UNITED TECHNOLOGIES RESEARCH CENTER

## Invention Disclosure

Shihong G. Song  
Materials and Processing

## Al-Gd alloy for Elevated Temperature Applications

Background

Cast and ingot/metallurgy (I/M) high temperature aluminum (HTA) alloys are characterized by the following metallurgic properties:

- 1) Primary alloy system, binary or ternary, is eutectic,
- 2) System eutectic composition is high in alloying content such that adequate volume fraction of the second phases (intermetallics) can be attained,
- 3) Main second phases (intermetallics) are of  $Al_3X$  (X is the primary alloying element) form,
- 4) A coherent or semi-coherent interface between aluminum matrix and the main second phase exists in nucleation and early stage of growth during solidification,
- 5) The melting point of the intermetallics is significantly higher than the that of aluminum,
- 6) Alloy eutectic temperature is not significantly lower than the melting point of aluminum,
- 7) Low solubility of the primary alloying elements in the aluminum matrix.

Three rare earth (RE) elements, namely yttrium, ytterbium, and erbium, have been identified to possess most of these properties. None of these elements, however, are best suited for the purpose in both cost and property terms.

It was recently recognized that gadolinium can serve as a better candidate than the above three for the intended applications, which is elaborated below.

Invention

Gadolinium is a RE element bridging light and heavy RE groups. Its commercial availability is similar to yttrium and is among the top rare elements with relatively high yield on the market. This is also reflected by its current low price (70% of yttrium). Gadolinium has a limited application in nuclear industry because of its large cross section area, but having a low absorption parameter.

Aluminum gadolinium system has the highest RE content at the binary eutectic composition (~5 at%) among Al-RE systems. The binary  $Al_3Gd$  intermetallic is the most stable (mp~1125°C) among the  $Al_3RE$  group.  $Al_3Gd$  is comparable to  $Al_3Y$  in terms of crystal structure and can easily form coherent and semi-coherent interface with the aluminum matrix. Other properties of Al-Gd system are similar or better than Al-Y system.

Gadolinium is very attractive to replacing Yb and Er in the cast and I/M HTA materials. It is worth noting that the neglect of the gadolinium in the initial effort of the present program was due to a printing error in the literature that was widely copied.

  
\_\_\_\_\_  
Inventor's signature

  
\_\_\_\_\_  
Date

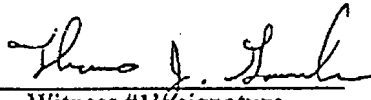
Shihong G. Song  
\_\_\_\_\_  
Inventor's printed name

  
\_\_\_\_\_  
Date

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Inventor's signature

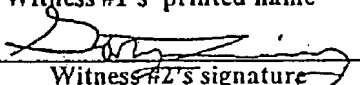
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\_\_\_\_\_  
Inventor's printed name

  
\_\_\_\_\_  
Witness #1's signature

  
\_\_\_\_\_  
Date

Tom Garosshen  
\_\_\_\_\_  
Witness #1's printed name

  
\_\_\_\_\_  
Witness #2's signature

  
\_\_\_\_\_  
Date

Gary D. Linsey  
\_\_\_\_\_  
Witness #2's printed name



## UTRC INVENTION QUESTIONNAIRE

Title of Invention:	Al-Gd alloy for elevated temperature applications		
Program Name:	UTRC internal	Division Program Leader(s):	Vince Nardone
TO BE FILLED OUT BY LEGAL DEPARTMENT ..... DOCKET NUMBER: .....			

- 1. Specific development of this invention:**
- (a) When did you conceive this invention? Date: [REDACTED]  
To which project were you charging your time? Project No.: [REDACTED]
- (b) Has the invention been successfully built or tested? Yes [REDACTED] No [REDACTED]  
• If yes, when? [REDACTED] How? [REDACTED]  
• If no, what future effort is planned to build or test this invention? depending on future funding [REDACTED]  
• What business unit, government agency, or customer will sponsor the testing? [REDACTED]
- 2. UTRC Contract and proposal information (include both government and commercial contracts):**  
Was the invention conceived or successfully built or tested in the performance of work under:
- A UTRC Prime Government Contract or a Commercial Contract/Agreement: Yes [REDACTED] No [REDACTED]  
Gov't Contract #: [REDACTED] or Commercial Contract/Agmt #: [REDACTED]  
Gov't Agency or Customer Name: [REDACTED]
- A UTRC Subcontract under a non-UTC Prime Government Contract: Yes [REDACTED] No [REDACTED]  
Subcontract #: [REDACTED] Customer Name: [REDACTED]
- An InterDivisional Work Authorization (IDWA): Yes [REDACTED] No [REDACTED]  
UTC Business Unit: [REDACTED] Business Unit Gov't Contract #: [REDACTED]
- 3. Disclosure of invention outside UTC:**
- (a) Has the invention been disclosed to others outside UTC, or included in any printed publications, seminars, presentations, trade shows, exhibits? Yes [REDACTED] No [REDACTED]
- (b) If yes, disclosed to whom and under what circumstances? [REDACTED]
- (c) Date of disclosure: [REDACTED]
- 4. Business Unit Information:**
- (a) UTC Business Units that may be interested in this invention: [REDACTED]
- (b) Names of individual(s) at each Business Unit who should be contacted to evaluate invention:  
Craig Walker, John Miller
- (c) Current or potential uses/products: Turbine engine components

	Inventor # 1	Inventor # 2	Inventor # 3
Inventor(s) signature:			
Typed Full Legal Name:	Shihong Gary Song		
Business Unit:	UTRC		
Mail Stop:	129-22		
Telephone:	[REDACTED]		

	Inventor # 4	Inventor # 5	Inventor # 6
Inventor(s) signature:			
Typed Full Legal Name:			
Business Unit:			
Mail Stop:			
Telephone:			

UTRC 2-31